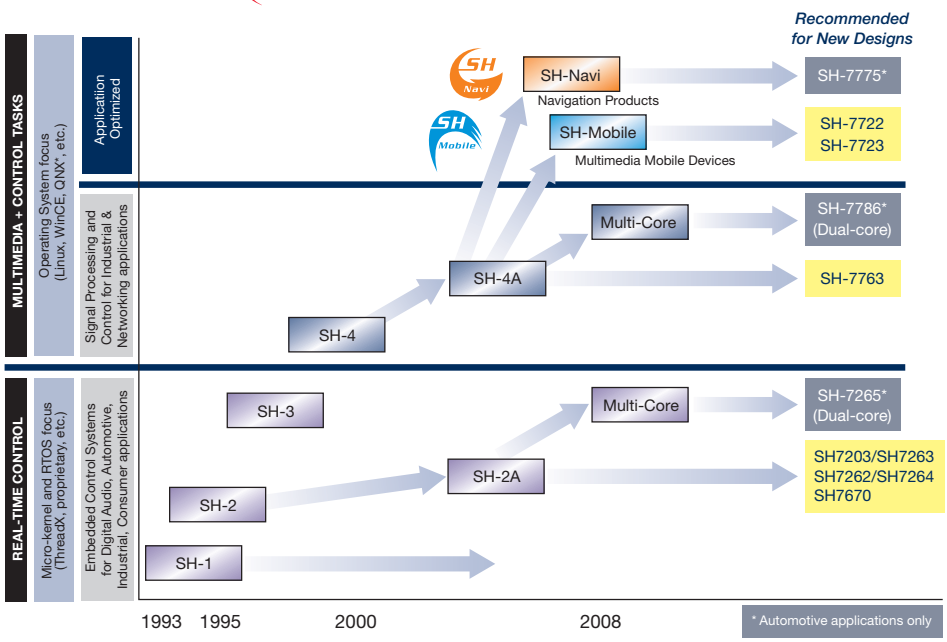
SuperH Microprocessor Solutions

Technology Update

Renesas Technology, the #1 global supplier of microcontrollers, created and continues to expand and enhance the popular top-end SuperH® family of microcontrollers (MCUs) and microprocessors (MPUs) for embedded RISC applications. This product brief highlights just the latest devices in the SuperH MPU product line, recommending SoC solutions for new designs (see Technology Roadmap, right).

Devices in the superscalar SH-2A CPU family with floating point unit and many peripheral functions are ideal for digital audio, display and control applications. Products in the superscalar SH-4A CPU family with floating point unit, MMU and on-chip media processing blocks are ideal for multimedia and portable applications. These advanced RISC processors are supported by a comprehensive range of upgraded Renesas HW/SW system development tools and reference design platform examples, as well as products and services from a global network of third-party suppliers.

Technology Roadmap



Key Applications

- **Entertainment and communication**
  - Digital audio and media players, electronic picture frames
  - Networking/Internet equipment
  - Portable devices, personal navigation devices
  - DVCs, DSCs, image processing equipment, etc.
- **Human Machine Interfaces (HMI)**
  - Home appliances, medical equipment
  - Printers, fax machines, copiers
  - Factory automation equipment, machine tools
  - POS terminals, handheld devices
- **Automotive and transportation systems**
  - Car navigation systems, CIS telematics products, multimedia equipment
- **Among others**

SuperH Advantages

- **General-purpose and application-optimized solutions** deliver excellent performance and many features, including power-efficient operation, at competitive price points
- **Platform solution strategy** saves time and resources by encompassing hardware, operating systems, drivers, development tools, middleware, and SDK-level support
- **Superscalar architecture with FPU** in single-scalar cost range provides faster application execution (more MIPS/MHz) so end systems can offer better performance
- Global investment in **Linux ecosystem** for SuperH devices supports this operating system with a unified kernel, tools, and driver structure
- Renesas, an industry leader, boasts a **superb reputation worldwide for high quality** and has tremendous resource depth in manufacturing facilities, LSI design, platform design, RF technology, communication protocols, etc.
- The broad span of technologies in which Renesas makes ongoing investments includes **audio/video processing, graphics, GPS, WLAN, SiP packaging,** etc.

SuperH Solutions Technology Update: SH-2A CPU

Processors with SH-2A Superscalar CPU

The SH-2A CPU core is a 32-bit superscalar design, upward compatible from the SH-2 CPU, which executes two instructions in parallel for twice the throughput. Thus, MPUs in the SH-2A series provide more MIPS at lower clock frequencies — for example, 480 Dhrystone MIPS at 200MHz — so they consume less power and generate less noise. They provide an on-chip hardware Floating Point Unit (FPU) that accelerates math operations and signal processing algorithms, providing up to 2MFLOPS/MHz performance. The devices have fast interrupt response and make single-cycle context switches. Moreover, the SH-2A devices are members of a scalable product family, ensuring a long product life.

For new system designs, the SuperH products recommended in the SH-2A series are the following:

- **SH7203/SH7263**
- **SH7670**
- **SH7262/SH7264**

SH7203/7263: Embedded Digital Audio Processors with LCDC and USB 2.0 High-speed Host

Combining connectivity, LCD display controller, and digital audio processing with a 200MHz SH-2A CPU that can handle both control and human-machine interface (HMI) tasks

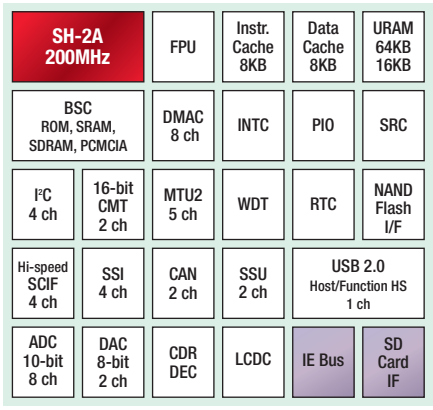
The microcontrollers in the SH7203/7263 series are single-chip solutions for car audio, home audio, and similar digital audio and media systems, as well as HMI applications requiring an LCD GUI. Operating at speeds up to 200MHz, they deliver enough performance to handle both signal processing for playing encrypted digital audio files and displaying digital pictures, and embedded control tasks like motor control. They include a high-speed USB 2.0 host interface for portable-audio-player connectivity, an LCD controller for WVGA-size color screens, and a CD-ROM decoder (SH7263 only) and additional audio peripherals, among many other on-chip functions.

These MPUs are supported by a comprehensive suite of system development tools and evaluation boards from Renesas and partners. This support includes the Renesas SH7263 Evaluation Board with VGA TFT LCD, which comes with Express Logic's ThreadX® RTOS and USBX™ and FileX® products, as well as Swell Software's Peg™ GUI library product. The result is a ready-to-go solution that's robust and saves man-months of development time.

SH7203/SH7263 Benefits:

- **Provides enough computing power to handle both control and signal-processing tasks**
- **Allows MP3, WMA, AAC, and similar voice and music data compression and expansion processing to be executed by a single chip at a slower frequency with a smaller program**
- **Enables implementation of multi-CODEC compatibility by software alone for greater design flexibility**
- **Offers high ROM code efficiency, allowing reductions in memory size and power consumption**
- **Connects via USB 2.0 to portable audio players and other devices and peripherals**
- **Incorporates many functions required for audio systems, making possible system cost-reductions**
- **Has CAN controller that implements robust networking**
- **Includes timer functions that can produce a 3-phase output for controlling AC motors**
- **Power management modes optimized for tasks being performed, helping to maximize battery life**
- **Provides comprehensive support tools that help shorten system development cycles so products get to market in less time**

SH7263 Block Diagram



SH7265 Dual-core Processor for High-performance Automotive Control

Asynchronous dual-core architecture for embedded systems uses two 200MHz SH-2A CPU cores to deliver up to 960 MIPS while keeping power consumption low

The 32-bit SH7265 dual-core processors achieve up to 960-MIPS/800-MFLOPS performance (at 200MHz) — performance that, when combined with the on-chip peripheral functions, addresses the design requirements of many high-end automotive engine, body control and safety system applications. They save power while delivering the fast real-time control and processing performance that previously required a DSP chip. Each of the chip's SH2A-FPU cores has an 8KB cache, and there are 64Kbytes of URAM on CPU0 (the primary CPU) and 32Kbytes on CPU1 (the secondary CPU). In a typical application, CPU0 might provide system control, while CPU1 handles tasks such as motor control or communication control. The SH7265's many built-in peripherals include a USB v2.0 High-Speed (480-Mbps) interface, ATAPI interface, and 2D graphics engine WQVGA/QVGA-size RGB outputs for image/video output processing. Four separate clocks and six power-down modes allow tight control over power consumption. The multi-core debugger connects using the same E10A H-UDI port connector that has been used in the past.

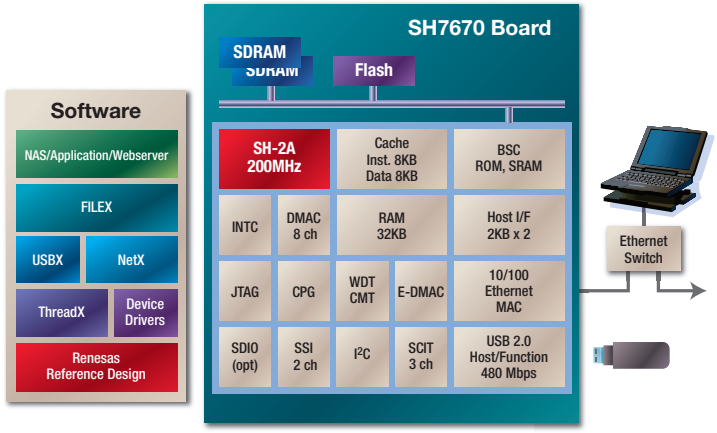
SH7670: Embedded Processors with Ethernet MAC and High-speed USB 2.0 Host

Delivering the performance, integration and connectivity needed for home networking, office automation and industrial networking applications

The MPUs in the SH7670 series have a 200MHz SH-2A 32-bit CPU core with FPU and integrate an Ethernet MAC, USB high-speed host/function controller and many other peripheral functions. They deliver the high-speed instruction execution, low-power operation, and built-in functionality needed for creating advanced designs for applications such as network hubs and gateways, security and DRM license-management functions, NAS equipment, digital A/V products and multi-node industrial control systems, among many others. One standout feature of these devices is the fast Host Interface (HIF) that enables another system CPU to offload I/O and connectivity functions to the powerful SH7670.

These microprocessors are supported by a comprehensive suite of system development tools and evaluation boards from Renesas and partners. For example, the Renesas M3A-HS71G50 board with Express Logic's ThreadX® RTOS and networking products implements a thoroughly proven solution that saves system development time and cost.

Simple NAS example



SH7670 Benefits:

- **Provides HIGH computing power (1.8MIPS/MHz) for handling control plus signal-processing tasks**
- **Offers high ROM code efficiency so less external memory is needed**
- **Delivers high-throughput connectivity via Ethernet and USB 2.0 ports for efficient interfacing to systems, subsystems and other chips**
- **Interfaces seamlessly with the main CPU in embedded systems, offloading it to make more computing bandwidth available for control and communication functions**
- **Integrates a rich peripheral set that maximizes system performance, reduces the system BOM, achieves a smaller footprint on the circuit board**
- **Operates with relatively low power consumption and offers power-down modes for optimizing power dissipation according to the tasks being performed, thus helping to maximize battery life and enabling "green" system designs**
- **Provides comprehensive support tools and products that help shorten system development cycles so products can be moved to market quicker**

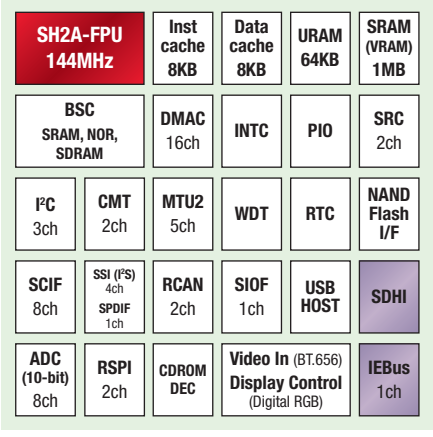
SH7262/7264: Microcontrollers with 1Mbyte On-Chip SRAM for Digital Audio and Graphical Dashboard Applications

Supporting a VGA-size TFT-LCD panel without external SDRAM and implementing most of the electronics of mid-range and low-end systems in a single chip

The highly integrated 144MHz MPUs in the SH7262 and SH7264 series target mid-range and low-end consumer, automotive and industrial such as digital audio systems and graphical dashboards for automobiles. Containing many hardware functions and 1MB of SRAM, they make it possible to design — mainly with a single chip —products that provide powerful graphics capabilities or TV display functions. The chips can handle timing, communication, interface, decompression, display drive, motor control, data conversion, and other tasks.

For system development, an on-chip debugging function and the E10A-USB emulator can be used. Other support products include the soon to be available Renesas SH7264 Evaluation Board with VGA TFT-LCD and Express Logic's ThreadX® RTOS and USBX, FileX products, as well as Swell Software's Peg GUI library. Middleware supports compression standards such as MP3, WMA, and AAC.

SH7264 Block Diagram



SH7262/7264 Benefits:

- **No external SDRAM needed for a WQVGA-size TFT-LCD panel display**
- **Extensive peripheral integration for compact, low-cost system designs**
- **Motor-control PWM timer can control the display of up to four gauges**
- **Optional SDIO, CAN or IEBus interfaces facilitate networked applications**

SuperH Solutions Technology Update: SH-4A CPU

Processors with SH-4A Superscalar CPU

The SH-4A 32-bit superscalar CPU core is upward compatible from the SH-4 CPU and executes two instructions in parallel for twice the throughput, like the SH-2A CPU. Thus, MCUs in the SH-4A series provide more MIPS at lower clock frequencies — up to 720 Dhrystone MIPS at 400MHz — so they consume less power and generate less noise. The on-chip hardware Floating Point Unit (FPU) provides up to 7 MFLOPS/MHz performance for accelerating math operations and signal processing algorithms. A DDR1/DDR2 interface to external memory enables higher system throughput and allows the use of mainstream DRAM chips for good availability and low system cost. The devices have fast interrupt response and make single-cycle context switches. Finally, Renesas has many automotive and industrial customers for the SH-4A devices and maintains long product life cycles for the chips.

For new system designs, the SuperH products recommended in the SH-4A series are the following:

- **SH7763**
- **SH7722/7723**

SH7763: Highly Integrated Embedded Processor with MMU, Ethernet, USB and More

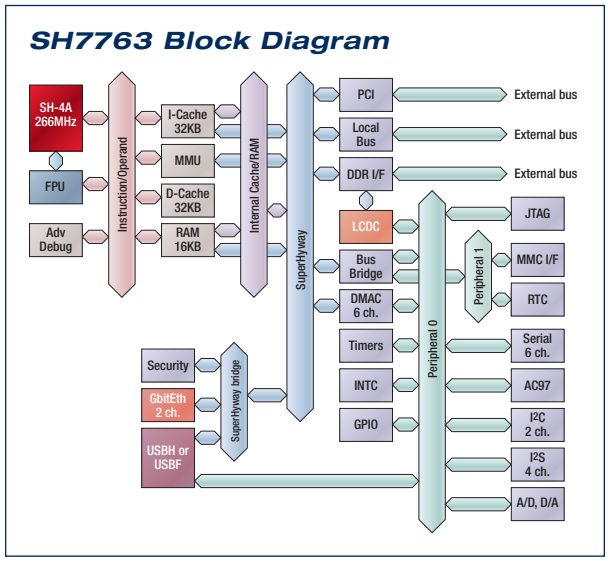
Offering the performance, peripherals and support needed for network-connected, industrial, and office applications, among many others

The high-performance SH7763 has high peripheral integration, provides standards-based network connectivity, and includes an MMU for advanced RTOS support. It's an excellent choice for a wide range of industrial, commercial and consumer products and systems that require Ethernet and USB connectivity. Its superscalar SH-4A 32-bit RISC CPU with FPU offers 480 MIPS and 1862 MFLOPs performance at 266MHz, more than sufficient for use with advanced operating systems. The extensive set of peripherals includes a DDR1/2 memory interface, SD I/F, LCD panel control, IP-Sec accelerator, PCI bus I/F, and more. The internal SuperHyway bus improves application performance by allowing simultaneous transfers of data between memory and peripherals at high speeds. The easy-to-use HEW integrated development environment includes support for the E10A JTAG debugger. Designs are accelerated using the SH7763RDP reference design platform, with BSPs for Windows®CE and Linux®.

SH7763 Benefits:

- **Achieves high performance for quick response in feature-rich, high-level operating systems**
- **Readily handles compute-intensive tasks in embedded environments**
- **Saves power by providing fast application execution throughput with a low clock frequency (achieves 1.8MIPS/MHz)**
- **Supports Linux, WinCE, and other RTOSs with graphics libraries for driving high-resolution displays**
- **Has high-bandwidth internal bus that supports fast peripheral functions**
- **Connects to external DDR SDRAM for high system-memory bandwidth**
- **Allows network routing applications that simplify cabling**
- **Provides integrated connectivity to additional peripherals and other host systems**
- **Protects network data without degrading applications that run simultaneously**

SH7763 Block Diagram



SH7775: SH-Navi Series Processor for Automotive Navigation and Information Systems

Enables superior car information systems at lower prices by delivering 1-GIPS/4.2-GFLOPS throughput capabilities, a 3D-graphics engine, GPS baseband module, and more

The SH7775 is optimized for automotive applications — specifically navigation systems and other in-vehicle car information system products. The device achieves 1 GIPS/4.2 GFLOPS performance at 600MHz and incorporates a GPS baseband processing function and an enhanced 2D/3D graphics engine with PowerVR® MBX from Imagination Technologies, Ltd., for generating maps and 3-D images. Capabilities of this engine include triangle 3D drawing and texture mapping.

This SoC processor also provides many additional peripherals essential for next-generation in-vehicle safety and convenience systems that work better, offer more features, and cost less. The on-chip peripherals encompass the functions essential for target applications to save cost and space. The Renesas E10A-USB emulator aids system development environment and the SH7775's on-chip debugging function allows real-time debugging at 600MHz. A reference platform with appropriate functions accommodates custom user functions. It can be used as a verification environment and a software development tool.

SH7722/7723: SH-MobileR Series Processors for Multimedia Mobile Products

Enabling multimedia devices that require both high performance and low power consumption

The SH7722 and SH7723, application processors in the SH-MobileR series, deliver the high level of audio, video and communication performance essential for leading-edge portable multimedia products, as well as the power efficiency necessary for long battery life. The SH7723 can operate up to 400MHz for up to 720MIPS and 2.8GFLOPS processing.

The SH7722 has a low-power video processing unit that allows the display of smooth moving images equivalent to that of standard TV when decoding a compressed signal at bit rates up to 12Mbps. The SH7723 has a L2 cache and provides among its many peripheral functions MPEG4, H.264 and JPEG accelerators. The Migo-R Linux® reference design supports the SH7722, and the DiamondHead platform for the SH7723 will be available soon, offering support for Linux and Windows®CE.

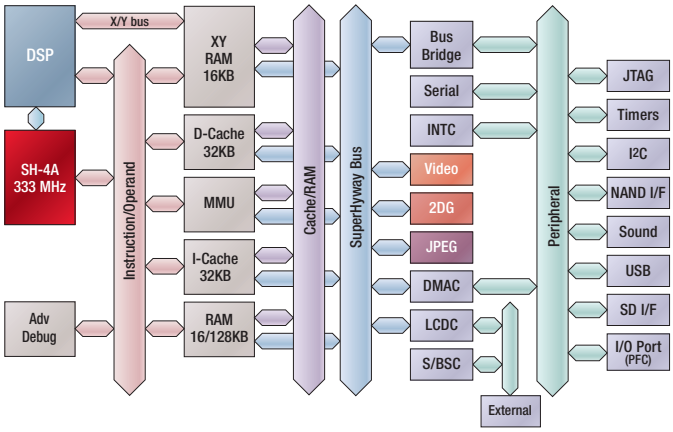
SH7722 Benefits:

- **Provides most or all of the necessary multimedia peripheral functions, thus enabling compact, low-cost designs**
- **Supports the latest audio and video technologies, including 2-way H.264 video at 30fps**
- **Interfaces seamlessly with and offloads the main CPU so it has more computing bandwidth for performing control and communication functions**
- **Saves power by providing fast application execution throughput with a relatively low clock frequency (achieves 1.8MIPS/MHz)**
- **Is supported by the Linux-based Migo-R reference design**
- **Enables shorter system development cycles**
- **Needs fewer external functions, saving cost and board space**
- **Connects to external SDRAM, NOR and NAND flash memory**
- **Drives high-resolution WVGA displays that deliver a rich GUI experience**

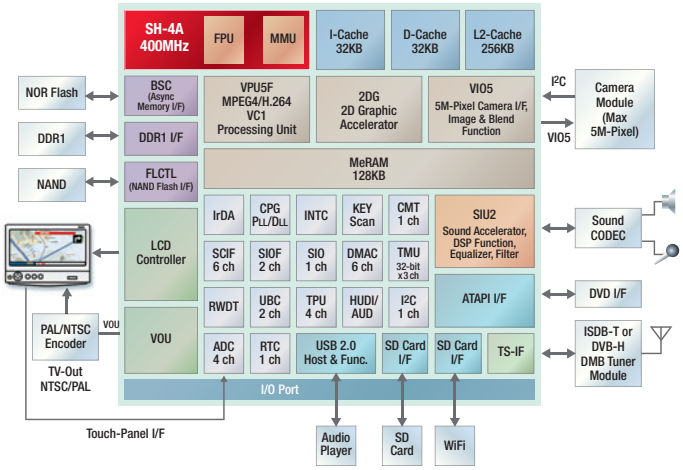
SH7723 Benefits:

- **Can be used as a media coprocessor, freeing up the host controller**
- **Enables bi-directional video H.264/MPEG4 VGA-size encoding and decoding at 30fps up to 8Mbps**
- **Draws faster, better-quality maps and produces clear TV pictures**
- **Compact 16-bit-wide instruction set requires 30-40% less memory than comparable systems**
- **Power-saving architecture and modes**
- **Drives high-resolution displays that can deliver a rich GUI experience**
- **Diamond Head Reference Design Platform exemplifies fewer external functions being required and supports Linux, Windows CE and other RTOSs**

SH7722 Block Diagram



SH7723 Block Diagram



SH7786 Dual-core Processors for High-performance Multimedia Systems in Automobiles

The advanced devices for automotive applications achieve 1920 MIPS performance and have an 800MB/s PCI Express bus interface

The 32-bit SH7786 processors harness the processing power of dual SH-4A CPU cores to deliver performance levels up to 1920 MIPS, using a 533MHz clock. They incorporate an internal PCI Express bus interface capable of high-speed data transfers at up to 800Mbytes/second. This makes it possible to reduce system power consumption and implement complex processing tasks such as image recognition and sophisticated graphics by connecting the microcomputers to external high-performance devices via PCI Express bus links. To aid software development, the chips also provide H-UDI (User Debug Interface) and AUD (Advanced User Debugger) on-chip debug functions for performing real-time debugging and trace collection, even at the processors' 533MHz maximum operating frequency.

Tools for Evaluation, Design and Debugging

Renesas and third-party suppliers provide a wide range of hardware and software tools and other support services. The products Renesas offers cover all stages of the development of embedded systems that use SuperH MCUs and MPUs.

Evaluation

Low-cost or no-cost Renesas tools make it easy to discover the capabilities of SuperH MCUs and test the problem-solving power of popular support tools. Those tools include the following:

- HEW IDE with complete SW toolchain (optimized C compiler and more)
- Evaluation boards (EDKs) for testing code on known working hardware
- Renesas Interactive (www.renesasinteractive.com), a website with tutorials and free PC-controlled lab setups for experimenting with chips and tools

System Design

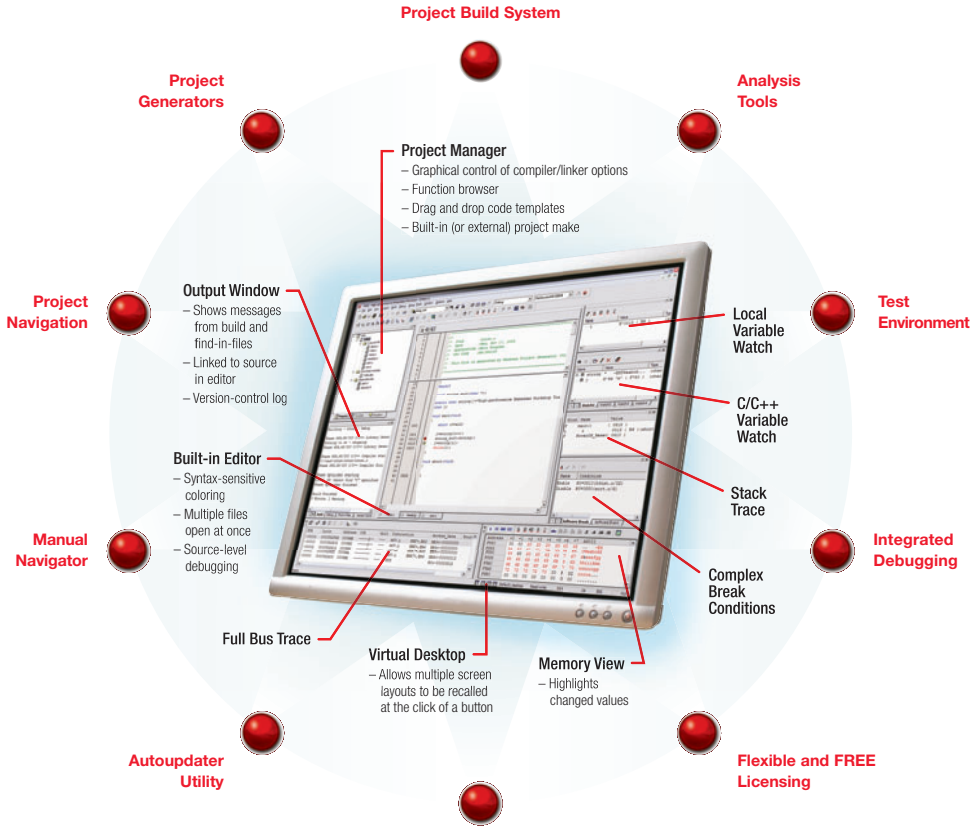
Proven/tested products are available that combine processors, external peripheral functions, and SW to help jump-start new system designs. Examples include:

- Renesas Starter Kits (RSKs) with basic functionalities
- Reference platforms that implement the key functions of specific types of applications and allow customization.

Debugging

Code can be developed using the compiler and SW tools in the HEW environment. Bugs can be tracked down using on-chip emulators or full in-circuit emulators.

HEW 4 Integrated Development Environment

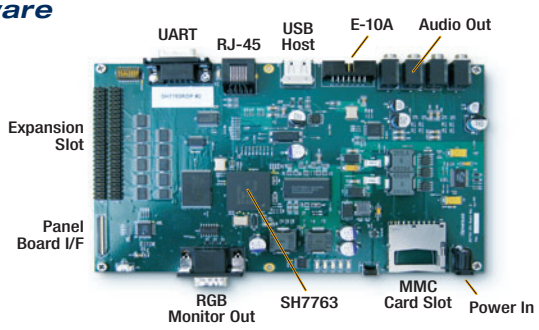


Powerful, versatile and easy to use, HEW facilitates code optimization. It includes an optimized C compiler, linker, debugger and RTOS kernel awareness. A free version can be downloaded from america.renesas.com/hew.

Examples of Available Hardware

The SH7722 Migo-R platform facilitates the development of WiFi Video VoIP products, surveillance cameras, digital media/TV player devices, portable navigation units, and dual-mode (WiFi and GSM) mobile phones.

The Renesas E10A emulator uses an OCD host-target connection for download, run control and trace operations.



The SH7763RDP Reference Design Platform and WVGA panel facilitates development of industrial HMI and networked and control applications using Linux or Windows CE OS.

The SH7263 Media Player reference development system plays MP3, AAC, WMA, or WAV format music while displaying JPEG photos. This system uses Express Logic's ThreadX, USBX, NetX, FileX and PegX, saving man-months of development time.

SuperH Support from Express Logic: ThreadX® RTOS and More

expresslogic THREADX®

- **ThreadX® — *Real-time operating system***
  - Optimized — small, fast and easy to use
  - Royalty-free
- **NetX™ — *TCP/IP Stack***
  - Optimized for speed and small size
  - Royalty-free with source code
- **FileX® — *MS DOS FAT File management system***
  - Royalty-free with source code
  - Supports a variety of physical media: RAM disk, Flash (CompactFlash, MemoryStick, and DiskOnChip)
- **USBX™ — *Universal Serial Bus (USB) protocol stack***
  - Supports Host and function
  - Royalty-free with source code

SuperH Support from SWELL Software: PEG® Family of GUI Development Tools

SWELL software

- **Peg Pro™**
  - For complex, high color GUI
  - Multiple graphics layers
  - Transitions, switches, sliders

- **Peg+™**
  - For controllers, panels
  - Full Widget library
  - Fast, small footprint, event driven

- **C/Peg™**
  - For QVGA and smaller displays
  - Small footprint
  - Limited widget library

	SH-2A	SH-4A	SH-Mobile
Third-party RTOS Support			
CMX		✓	
Express Logic ThreadX	✓	✓	
Mentor Nucleus		✓	✓
Micrium uCOS	✓	✓	
Microsoft Windows®CE		✓	✓
Open Source Linux		✓	✓
QNX		✓	✓
Third-party Compiler Support			
KPIT GNU	✓	✓	✓
Red Hat GNU	✓	✓	✓

Third-party Tools

BP Microsystems (Programmers)	www.bpmmicro.com
DataIO (Programmers)	www.dataio.com
Lauterbach (Emulators)	www.lauterbach.com
Sophia Systems (Emulators, Programmers)	www.sophia-systems.co.jp
Tokyo Electech (Programmers)	www.tetc.co.jp
Yokogawa (Emulators, Programmers)	www.yokogawa-digital.com/en

Third-party Middleware and System Integrators

Adeneo	www.adeneo-embedded.com
BlueCap	www.bluecapsoft.com
Esol	www.esol.co.jp/english
HI Corp	www.hicorp.co.jp/english
Innovative Logic	www.inno-logic.com
MPC Data	www.mpcdata.com
Paragon Innovations	www.paragoninnovations.com
Swell Software	www.swellsoftware.com
Systemic Realtime Design	www.sysrtime.com
Trinity Convergence	www.trinityconvergence.com
TrollTech	www.trolltech.com
TrygTech	www.trygtech.com

Long-term customer support programs — Renesas Ecosystem

Samples

- Get a first-hand look at our products. Let us know your needs, and we'll get some samples out to you.

America.Renesas.com/Samples

Alliance Partner Program

ALLIANCE PARTNER RENESAS

- The Alliance Partner Program allows you to connect instantly with hundreds of qualified design consulting and contracting professions.

America.Renesas.com/Alliance

Renesas Interactive

Renesas INTERACTIVE

- Gain the technical knowledge you need. Evaluate, research, and learn Renesas microcontrollers and tools at your own pace, where you want, when you want, and always for free.

RenesasInteractive.com

Renesas University

RENESAS UNIVERSITY PROGRAM

- For educators and students. Get published. Teach with professional grade tools. Learn MCUs with a modern architecture.

RenesasUniversity.com

My Renesas

MyRenesas

- Customize your data-retrieval needs on the Renesas website. You'll receive updates on the products that you're interested in.

America.Renesas.com/MyRenesas

RenesasRulz

RenesasRulz.com

Think it. Build it. Post it.

- A community site and gathering place for technical information and those who use Renesas microcontrollers and microprocessors.

RenesasRulz.com

SuperH MPU Selector Guide

Group	Ordering Part Number	CPU			Memory					Connectivity						Peripherals								Special Features	Temp. (°C)	Package
		Max Frequency	Cache Inst. (KB)	Cache Operand (KB)	Internal RAM (High speed, Data)	Ext. NAND	Ext. NOR	Ext. RAM	DMAC channels	SDIO	USB2.0 480Mbps Host/Fn	CAN	Ethernet	Serial	I²C	Timers	Watchdog	Interrupt Controller (ext.)	10-bit ADC (ch)	8-bit DAC (ch)	Power Down Modes	GPIO	LCD Controller			
SH7203	R5S72030W200FP	200	8	8	64KB, 16KB	Y	Y	SRAM, SDRAM	8	N	Y	2	N	5	4	MTU2, CMT, RTC	1	17	8	2	4	82	WVGA, 16Bpp	SSI	-40 to +85	240QFP 32x32, 0.5mm
SH7263	R5S72630P200FP	200	8	8	64KB, 16KB	Y	Y	SRAM, SDRAM	8	N	Y	2	N	5	4	MTU2, CMT, RTC	1	17	8	2	4	82		SSI, CDROM controller	-40 to +85	240QFP 32x32, 0.5mm
	R5S72633P200FP	200	8	8						Y	Y	2	N	5	4									SSI, CDROM controller, IEBus	-40 to +85	
SH7262	R5S72620W144FPU	144	8	8	64KB, 1MB, 32KB	Y	Y, SPI	SRAM, SDRAM	16	Y	Y	N	N	10	3	MTU2, CMT, RTC	1	17	4	-	4	89	Video controller, VGA TFT	SSI, CDROM cont, Sample rate conversion, Decompression unit, IEBus, Camera input	-20 to +85	176QFP 24x24mm 0.5mm
	R5S72621W144FPU	144	8	8						Y	Y	2	N	10	3										-20 to +85	
	R5S72620P144FPU	144	8	8						Y	Y	N	N	10	3										-40 to +85	
	R5S72621P144FPU	144	8	8						Y	Y	2	N	10	3										-40 to +85	
SH7264	R5S72640W144FPU	144	8	8	64KB, 1MB, 32KB	Y	Y, SPI	SRAM, SDRAM	16	Y	Y	N	N	10	3	MTU2, CMT, RTC	1	17	8	-	4	89			-20 to +85	208QFP 28x28mm 0.5mm
	R5S72641W144FPU	144	8	8						Y	Y	2	N	10	3										-20 to +85	
	R5S72640P144FPU	144	8	8						Y	Y	N	N	10	3										-40 to +85	
	R5S72641P144FPU	144	8	8						Y	Y	2	N	10	3										-40 to +85	
SH7670	R5S76700B200BG	200	8	8	32KB	N	Y	SRAM, SDRAM, PCMCIA	8	N	Y	N	10/100, EDMAC	3	1	CMT	1	9	-	-	3	86	-	STIF, SSI, HIF	-20 to +70	256QFP 18x18 0.8mm
	R5S76700D133BG	133	8	8						N	Y	N	10/100, EDMAC	3	1										-40 to +85	
	R5S76710B200BG	200	8	8						Y	Y	N	10/100, EDMAC	3	1										-20 to +70	
	R5S76710D133BG	133	8	8						Y	Y	N	10/100, EDMAC	3	1										-40 to +85	
SH7763	R5S77631Y-266BGV	266	32	32	16KB	N	Y	SRAM, SDRAM, DDR, PCMCIA	6	Y	FS	N	2ch x 10/100/ 1G	6	2	TMU, CMT, RTC, TPU	1	33	4	2	5	Y	1024 x 1024 24bpp	UBC, PCIC, SSI, HAC, SIM, STIF	-20 to +75	499BGA 21x21
SH7722	R8A77220AC266BAV	266	32	32	16KB, 128KB, 4KB	Y	Y	SRAM, SDRAM, PCMCIA	6	Y	Fn	N	N	6	1	TMU, CMT, RTC, TPU	1	9	-	-	3	Y		DSP, H.264, VPU, Video IO, JPEG, 2D Graphics, STIF, Keyscan, SIM	-40 to +85	417BGA 17x17
	R8A77220AC266BGV	266	32	32						Y	Fn	N	N	6	1										-40 to +85	449BGA 21x21
SH7723	R8A77230C400BG	400	32	32	256KB, 16KB	Y	Y	SRAM, SDRAM, DDR, PCMCIA	12	Y	Y	N	N	8	1	TMU, CMT, RTC, TPU	1	9	4	-	3	Y		MPEG4/H.264, VPU, Video IO, JPEG, 2D Graphics, STIF, ATAPI	-40 to +85	449BGA 21x21

NOTES:

SH-2A is Superscalar with FPU, Vcc = 1.2V, Advanced User Debug

SH-4A is Superscalar with FPU, Vcc = 1.2V, Advanced User debug

ACRONYMS:

MTU2 Motor timer
CMT Compare-Match Timer
RTC Real-Time Clock
SSI Serial Sound Interface
STIF Serial Stream Interface
HIF Host Interface
UBC User Break Controller
TMU Timer Unit
HAC Audio codec interface
TPU Timer pulse unit
SIM Smart card interface
VPU Video Processing Unit

© 2008 Renesas Technology America, Inc. Renesas Technology America, Inc. is a wholly owned subsidiary of Renesas Technology Corp. SuperH® is a registered trademark of Renesas Technology Corporation. All other trademarks are property of their respective owners. The information supplied by Renesas Technology America, Inc. is believed to be accurate and reliable, but in no event shall Renesas Technology America, Inc. be liable for any damages whatsoever arising out of the use or inability to use the information or any errors that may appear in this publication. The information is provided as is without any warranties of any kind, either express or implied. Renesas Technology America, Inc. reserves the right, without notice, to make changes to the information or to the design and specifications of its hardware and/or software products. Products subject to availability. Printed in U.S.A.

1008/3000/JP/PF/SP Order Number: REU01B0034-0101

Everywhere you imagine. RENESAS

Renesas Technology America, Inc.

450 Holger Way, San Jose, CA 95134
Tel:408-382-7500 Fax:408-382-7501
www.america.renesas.com